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A Perspective by W. David Hopper

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INDIA'S FOOD PRODUCTION

In 1966 the fields of the Indian Agricultural Research Institute in Delhi and of the Agricultural Universities of North India were green with the evidence of a potential revolution in India's agricultural production. The year 1966 must be counted as the founding year of the so-called "Green Revolution". It was the year in which the scientists knew with certainty that the biological basis for an immense increase in grain output was at hand. Despite the national shock of the sudden death of India's second Prime Minister, the human and economic cost of the sharp conflict with Pakistan of late 1965, and of the almost certain crisis of domestic food supply following the widespread failure of the monsoon rains in the previous kharif season, the mood of those few engaged in plotting the future of the nation's farm economy was one of ebullience. The problems and difficulties ahead would be many, but they were sure they had the solution to the long-sought goal of achieving a sizable increase in India's food production.

It is significant that, 10 years later, this lecture takes place on the Andhra coast under the sponsorship of Coromandel Fertilisers, since the transformation of Indian farming that followed 1966 was based on the productive interaction of plant nutrient, assured and timely crop moisture, and grain varieties capable of responding to high applications of each. The vision that preceded the construction of the Coromandel fertilizer plant gambled on matching the capacity of its nutrient manufacturing processes with the needs of a modern Indian agriculture. The experimental evidence of 1966 showed clearly that the stakes could be won.

It was with this sense of history that I accepted the honour of the opportunity to give this lecture. Although the recent history of Indian agriculture is still to be written, the broad outlines of that history hold as lessons for a world faced with a prospect of famine already evident. My statement is a personal perspective that centres on issues fundamental to the agricultural progress of this great nation.

I. 1947 to 1965: Trial and Doubt

I use "food production" interchangeably with "foodgrain output". This is not to say that the production of animal products,

vegetables, fruits, etc., is unimportant in India. I do so only because non-grain food production is small compared with foodgrain output, and to an important degree, foodgrain statistics are probably an excellent proxy for total food supply.

Food production in the early post-Independence years remains a statistical uncertainty. The slow absorption of the Princely States into the appropriate State and Central Government accounting systems leaves one in some doubt about the validity of production data prior to 1955. Nevertheless, and however imperfectly measured, food output rose during the First Plan period by over seven percent per annum, most of the rise occurring from an increase in the acreages used. The First Plan period ended with the widespread belief that sustaining agricultural production would not be a major economic problem.

It was with the Second Plan that the first real doubts about the nation's food production were raised. By the end of the Second Plan, food output had grown by less than three percent per year. Spurred by the low harvest of 1957-58, the Government of India entered into a longterm P.L. 480 agreement with the United States to obtain regular shipments of U.S. surplus grain on concessional terms. Behind this agreement was an understanding that such shipments would be used to build national buffer stocks to meet future emergencies of the kind that struck in 1957-58 when production fell by over seven percent from the average of the three preceding years.

I regard this first of several P.L. 480 agreements as one of the most important facts in the history of modern Indian agricultural development. Shipments under P.L. 480 agreements reached almost 8 million metric tonnes per year by the mid-sixties. What began as emergency aid, with the intent of protecting the Indian consumer in times of trouble, quickly became part of a continuing subsidy of the nation's food economy. The attractiveness of augmenting the Central Government budget with the proceeds of the immediate sale of imported grain was too great for the budget establishment in Delhi to forego, and the ready extra supply of grain assured planners of being able to stabilize food prices independent of domestic production. Perhaps most unfortunate was the coincidence of short-term interests between North America (for Canada, too, cannot escape the brunt of criticism in this account) and India – the Indian offtake was a boon to those in Washington and Ottawa who sought to manage their grain surpluses by filling ships for Bombay and Calcutta. This mutual

desire to move grain halfway around the world had calamitous longer-term consequences: it held farm prices for the Indian cultivator to a level that sapped incentives to produce, and it lulled Indian planners and a few political leaders into believing that it was cheaper and more efficient to farm the fields of Kansas and Saskatchewan for the nation's grain than to invest, at the cost of slowing industrial expansion, in a domestic capacity to grow food.

The price effect of the imports was most notable in wheat, with prices falling between 1959 and the third quarter of 1963. This drop resulted in a depression in private investment in the wheat areas of Northwestern India, the areas that had shown the greatest agricultural dynamism in the decade following Independence.

In retrospect, the neglect of farm prosperity in the late fifties and early sixties can only be deplored. But at the time, national decision-making in India was guided by two major considerations: the importance of building the nation's industrial base, an aim that could be attained only through some exploitation of the agricultural sector which generated almost 50 percent of annual gross product; and the deeply held conviction that farm prosperity and rural economic dynamism depended less on the interplay of market forces than upon transformation and reform of the social, political, and economic institutions of the countryside.

Concessional purchases of North American grain provided Delhi finance officials with an almost costless source of merchandise revenue; it eased the burdens on the planners of finding a balance between food, industrial production, and the control of domestic food price inflation – the most sensitive element in urban politics and industrial wage rates. Indeed, the grain transfers enabled the nation to speed its industrial growth and, in particular, to opt for a different balance between military and civil expenditures after the China War of late 1962. With grain so freely offered, and the domestic economic balances so precarious and yet so vital to the nation's longer-run growth and security, it is hard to be critical of those who advocated farming North America's fields and using the proceeds for India's development.

Yet, for all one can say to justify the decisions made in the late fifties and the first half of the sixties, the stark fact remains that Indian agricultural development was neglected. And the neglect proved to be shortsighted. The growth in agricultural production dropped from three percent per year between 1955 and 1960 to two

percent between 1960 and 1965; grain production growth fell from 2.9 percent to less than 1.6 percent in the same period. And reflecting the relative effects of food and non-food prices, the growth in production of non-food crops rose from 3.0 percent per year in the fifties to almost 3.5 percent in the sixties – the shift brought about primarily through acreage transfers from food to non-food crops.

To what extent the neglect of agriculture and the relative impoverishment of the nation's farmers in this period reflected economic factors alone, or a philosophy which was a mixture of economic and social-political elements, is hard to determine even for the involved observer. The Nagpur Resolution of the Congress Party on a cooperative structure for the Indian rural economy was not based on a careful economic analysis of national agricultural needs. It was a political pronouncement, and it had as its aim social-political change. I think it is undisputed that the strength of landowning interests prevailed over the cooperation implied in the Resolution. But it is important to recognize that even the landless were not enthusiastic about the goals implied, for it was their hope to be owners in right, not to be cooperants with undefined shares.

To understand this phase of Indian agricultural history, it is necessary to digress for a moment to the Community Development movement. It was an early effort at nation building among rural people that found its roots in emphasis on village uplift. The movement took on almost mystical tones in the early fifties as it sought to mobilize the energy and enthusiasm of rural India to transform through self-help and voluntary action their cultural, social, political, economic and physical milieu. It was too heroic a vision. It could not help but fail. To the villager it confused the important with the unimportant. In its transformation the imperative of change was placed above holistic view of the particular needs of rural folk. The movement foundered on the rocks of the short harvest in 1957-58. It left an important legacy, however: an administrative infrastructure of personnel and organization focussed on village development. To this legacy, I think reactions must be mixed. The movement was strong enough to divide the country into development blocks each with its assortment of officers and field workers, but not strong enough to re-align and match to these boundaries the administrative jurisdictions of the allied public agencies, such as the electricity boards, public works authorities and irrigation offices. Thus, even today, the coordination of development efforts within and

between blocks in a district is often a frustratingly difficult chore. Indeed, there is a case for a re-examination of all of India's rural administrative boundaries with a view to making the coordination and implementation of development action much more effective.

Yet for all the difficulties, many of the Community Development programs were and still are vital to India's rural progress. Community Development-inspired voluntary road-building in the early fifties was a failure. For most villagers, there was no economic reason to take land out of production to build a road. In the seventies, it is very different. Product and factor markets have opened, village people are much more mobile, modern vehicular traffic density in most rural areas is large when compared to the first decade of Independence. As India's economy has grown, the market-to-market roads that were needed to justify villagers investing in their own farm-to-market links have been constructed. Listen now to rural people and village roads are a priority need, but they weren't in the fifties. The historical precedent of a program failure at that time should not be allowed to weigh heavily now. But in making this point, let me hasten to add that there seems no clamour now for bricked streets, or latrines, or smokeless chulas just as there was no clamour more than twenty years ago.

The collapse of the drive behind Community Development in the late fifties can be traced to its immediate failure to provide a secure food base for the nation. The poor harvest of 1957-58 raised, for the first time since Independence, significant doubts about the "how" of agricultural, and particularly food production development. It gave pause to those who advocated a sweeping reform of India's patterns of rural culture. The debate around the Nagpur Resolution turned into a sterile argument over scale-economies in farming. And while many scholars continued to find intrinsic merit in the proposed reforms as a means of bringing about a more equitable distribution of rural wealth and income, this purpose was too often lost or forgotten in an expressed fear that any tampering with the fundamental cultural framework of rural India would result in an uncontrollable and unpredictable disruption of national stability. At the political level and among intellectuals of the country, the call was for an important and visible degree of rural reform; at the level of political action and among many of the voters, the degree of acceptable, implementable reform was very much less. The large zamindaris were broken up, but sweeping reforms of the land tenurial system

were not implemented; village self-government was proclaimed, but the actual administrative and judicial power transferred to village panchayats was small; bottom-up planning was called for, but the problem for senior political leaders and their expert advisors was to educate the people to want a "top-down" plan; people were encouraged to join and participate in local cooperatives, but cooperative affairs were tightly controlled by appropriate government departments and officials; rural debt reform and new and improved credit to small and tenant cultivators were called for, but debts remained a burden on the poor and public credit remained secured by instruments of land ownership. The list could go on. For those who believed that India's peasantry would rise in revolt if the reforms were not implemented, the seeming docility of the rural people was a disillusionment; for those who viewed national political postures with cynicism, the result was predictable; for those who believed that Indian agricultural progress rested with primary weight on the full reform of rural institutions, the result was frustration. But it was for the many who believed that national agricultural advance could be made without the need of drastic reform that the years between 1960 and 1965 bred disillusionment, cynicism, and frustration.

The almost static growth of domestic food production in the early sixties brought about a growing reliance on imports. Except for the bountiful weather of 1964-65, Indian annual food output hovered around 80 million tonnes throughout the period. Net imports rose from 3.5 million tonnes in 1960-61 to 6.3 million tonnes in 1963-64, and over these years net sales from small Government-held stocks totalled almost an additional two million tonnes. Yet, despite imports and stock reductions, per capita availability dropped each year from 1961 to 1964. The result of this stagnation was an upward pressure on prices, a pressure held in reasonable check until mid-1963. Between March and June of that year, the composite index of wholesale food prices rose seven percent; one year later it had climbed almost 20 percent. The record harvest of 1964-65 (89 million tonnes) slowed the increase to just under 13 percent in that year.

The failure of food production to respond to forces other than rainfall from roughly 1954 (at 72.2 million tonnes) to 1964 (at 80.5 million tonnes) could not help but generate a large measure of doubt and despair among those responsible for the nation's economic well-being. The unproductive apparatus of the Community Development programme was superseded in 1961 with the Intensive Agricultural

Districts Programme, popularly called the "Package Programme", a programme that was supposed to demonstrate the means for attaining increased food output. It, too, did not succeed. In fact, at the end of its first five years, its major supporters could claim only that its implementation revealed clearly the problems to be encountered in getting agriculture moving.

The period closed with drought in the summer of 1965 and by war later that year. Events that shattered all illusions.

II. 1965-68: Despair and Hope

The years 1965-66 and 1966-67 must surely be viewed in Indian history as both the nadir and the zenith years of the first quarter century of Independence. The weak monsoon rains in the summer of 1965 set the stage for a national brush with catastrophe. The brief but sharp and costly war with Pakistan in the fall of 1965, and the tragic, sudden death of Prime Minister Shastri in January 1966, added immensely to the economic and political burdens of the nation. The withdrawal of economic aid by the United States following the war served only to exacerbate an already calamitous situation. But of all these trials, the failure of food production to meet expectations posed the greatest threat to national integrity. The agricultural year 1965-66 saw total foodgrain output fall to its 1954 level of 72.3 million tonnes – a drop of 20 percent from the 89.4 million tonnes record crop of 1964-65, and over 11 percent below the 82.1 million tonnes average production of the previous five years. And to compound the tragedy, 1966-67 was little better. Total foodgrain output in that year rose by only 1.9 million tonnes.

Many of the consequences of these two disastrous agricultural years will be fruitful ground for exploration by various hyphenated historians in years to come. The still disputed devaluation of May 1966 can be traced directly to the economic troubles of these years; as can the "plain pause" that scrapped the draft of the Fourth Plan, and postponed its start, to permit the preparation of a new plan by a new Commission who would take fresh account of the nation's difficult economic circumstances. Food imports were stepped up through commercial purchases and concessional assistance agreements. Net imports in the two years totalled more than 19 million tonnes, approximately 13 percent of total domestic production. And prices rose despite rigid controls on grain movements in interstate

trade and an active procurement policy by both Central and State authorities. Grain prices at the end of 1965-66 were 50 percent above those of 1961-62; by the end of 1966-67, they were more than 82 percent higher. The terms of trade between manufacturers and farm commodities were moving steadily in favour of the cultivator. The output transferred from abroad was no longer sufficient to overcome severely lagging domestic production and the inexorable growth of population. Once again, food availability per capita dropped to about the level of the late 1940's. It was a low point in the course of national history.

That India passed through the depths of the mid-sixties famines with so little human loss is surely one of the finest hours in the nation's history. There were countless heroes of this test of nationhood. Three that stand out in my recollections are the Prime Minister whose tough support of her food administration permitted it to function despite the many political and economic pressures it had to endure. The second was the Minister of Food and Agriculture, C. Subramaniam, who had overall command of both the famine relief and planning for the recovery. The third was the Secretary of Food, A.L. Dias. Secretary Dias particularly bore the brunt of stretching too little among too many. To him especially the nation and the world owe a debt of gratitude for averting what could have been one of the very ugly chapters in the history of modern man. Indeed, when written, the story of those years will proclaim the greatness of the nation and its servants. It was truly a time of test; the challenge was met and surpassed, and the nation emerged stronger for it.

It was also a time of hope. In 1962, Dr. M.S. Swaminathan, then of the Indian Agricultural Research Institute, had taken the lead in bringing to India strains of the dwarf wheat varieties developed in Mexico by Dr. Norman Borlaug. By 1965, selections made at the IARI and the Punjab Agricultural University from these strains were being tested throughout India under experimental trials coordinated by the Indian Council of Agricultural Research. The field trials of these new strains produced more than double, sometimes triple, previously attained experimental yields. Through the work of plant breeders in Madras a new variety of high yielding rice became available to South Indian farmers, and from the recently opened International Rice Research Institute, came strains of dwarf rice with yield response similar to wheat. All these new biological strains were subjected to further test and selections by ICAR scientists. A visit to the

crop research stations of the country between 1965 and 1967 provided a startling contrast to the surrounding areas. In the midst of the worst national food crisis in two decades, the experimental plots were heavy with dense foliage and close-packed heads of grain. Here surely a hope of abundance amid the despair of want.

In early 1966, the Minister of Food and Agriculture, Mr. C. Subramaniam, boldly gambled on the research results and committed $5.0 million of the nation's scarce foreign exchange to purchase up to 20,000 tonnes of dwarf wheat from Mexico to be used as seed on Indian farms. The action was truly bold for reasons important to our story, and I want to dwell on some aspects of these.

In effect, the Minister gave official support to implementing a technological solution to the country's sluggish agriculture, a solution that would entail a major change in the national farm economy for the new varieties required non-farm inputs of fertilizer to reach their yield potential. It was an unexpected solution, little covered in the catalogues of proposals assembled from rural development specialists. It was a solution that earned hostility at the time it was made, and since then to the present. For some, it bypassed the problems and claimed needs of cultural, social, economic and political rural reform. For others, it opened the way to alien models of the agricultural economy. It was argued that applying modern farm technologies held the potential of strengthening capitalistic agriculture and, as a result, would benefit mainly rich, large farmers, that such technologies would open the way to large-scale commercial farm enterprises with consequent effects on small farmers and rural employment, that they would benefit areas that possessed irrigation facilities and a good infrastructure of farm services to the relative detriment of those living in more backward or less well endowed parts of the country. And, perhaps most interesting of all in a country in the depths of a famine and where most of the food output is directly consumed by those who produce it, that if the technologies were successful in raising output, it would sap the political will of the nation to implement reforms and might even bring the problems of surplus food supplies, opening to India all the farm problems of the industrial nations. Obviously, many of these concerns were valid, but it was wrong to use them as an argument for not moving along the one avenue that held evident hope for food sufficiency. Indeed, on one occasion, I saw Mr. Subramaniam sit patiently through the recital of

a long litany of reasons for persevering with a more vigorous implementation of the approaches of the Second and Third Plans to agricultural development, with the enjoinder that other avenues should not be opened or pursued. His response was simply to ask: "How do I feed our people? What hope have you offered me that I can pass to them?" It took an unusual brand of courage to persist along an untried path.

The second element of boldness in the decision was the belief that farmers would adopt the new varieties of grain if they were proven more productive. Not only were millions of farmers expected to change the varieties they plant, but also the cultural practices they follow in their farm operations including the use of cash to purchase inputs, especially fertilizer, and increased amounts of irrigation water. To my knowledge, only a few brave souls dared argue that the Indian farmer would innovate if the economic return warranted the expense and the risk. For most who applauded the decision to import the seed supply from Mexico, the hands were clapped with crossed fingers.

The third element of uncertainty that made the decision bold was greatest of all. The new wheat and rice varieties depended for their high yields upon large inputs of plant nutrient, particularly nitrogen. India's own production of this vital input was small. The timetable called for the imported seeds to be multiplied in the winter of 1967 so that enough seed for widespread farm use would be available in 1968. It left no time to build the fertilizer plants necessary to meet the demands of a large acreage in dwarf wheat two years hence. In 1966, except for concessional food aid (and even this was unsure), the inflow of foreign assistance to India depended more on the whim of U.S. President Lyndon Johnson than upon any rational assessment of the country's needs. Yet, by one projection, if the dwarf wheat seed did find a wide acceptance, 1968 fertilizer imports would have to climb from a few tens of millions of dollars to close to $250 million. This could only be met through foreign assistance. And because most external aid agencies were then reluctant to provide assistance resources for annual consumables, the task of assuring the innovative farmer of the production requisites he required to capture the yield potential of the new plant materials was much more difficult than dealing with a recalcitrant and mercurial U.S. President.

And then there were the myriad administrative problems to be overcome within the Indian rural development bureaucracy. The

demonstration plots had to be laid out, the credit channels opened, the fertilizer distributed, the irrigation water supplied, and so on.

The promise that shone from the experimental plots in 1965 demanded the modernization of the nation's agriculture if it was to bear fruit. It was a bold decision, indeed.

It paid off. It was the beginning of what the news media christened a "Green Revolution". In the rabi season of 1968, Indian wheat farmers produced 16.5 million tonnes of foodgrain, a third more than ever before. Within two more years, national wheat production was double the average of the early sixties. The Indian farmer proved to be not only innovative, but also eager to modernize his operation. Fertilizer imports in 1968 rose to roughly $280 million, most of it received under foreign assistance arrangements. The rural bureaucracy proved equal to its task as research scientists, extension officers, irrigation engineers, electricity board officials, cooperatives personnel, and everyone else around were melded into functioning units to support the spread of new agricultural practices. A task superbly managed by the Secretary of Agriculture, Mr. B. Sivaraman. By the end of 1968, it was obvious that some parts of rural India were caught up in a new dynamic. The hope was becoming a reality. The despair of the drought years was broken with a new vision of verdant fields of blue-green, nitrogen-rich plants.

Because the nature of this transformation is vital to what follows, I would like to pause and reflect a little on its nature and the circumstances of its course.

The first and most obvious element was the contribution of the new varietal material itself. Traditional Indian varieties had been selected by farmers and bred by scientists to survive under the difficult production conditions of the older farming patterns. The attempts of the Package Programme to encourage the use of fertilizer in the early sixties failed because traditional varieties, when fed a rich nutrient, either did not respond in yield because of a heavy early vegetative growth and lodging, or responded only marginally, yielding about ten pounds of extra grain per pound of added nitrogen. The new varieties were bred for a modern, high-production environment. They required careful and frequent waterings, and they could absorb large amounts of nutrient without faltering in their yields. Added grain went as high as 25 pounds per pound of additional nitrogen. With the new nutrient-responsive varieties, the Indian

farmer had, for the first time, the element missing in the production "package" pressed with little avail in older development programmes. When the technological promise of this integrated set of production practices was demonstrated, farmers were interested. The increased yields were obvious from even a cursory examination of trial plots and when farmers shared their experiences among themselves, the new practices became as well known as the new varieties.

The varieties emerged from research in both Mexico and India. Until the dwarf wheat tests in the early sixties, Indian research was guided by the belief that advances in Indian food agriculture would come from within the framework of traditional farming. Applications of high nutrient levels made sense in commercial cash crops such as cotton and tobacco, but, in common with most Indian economists and planners of the time, researchers did not envisage as a food agriculture based on fertilizer use, high levels of irrigation, and modern methods of pest and pathogen control. Thus, research focussed on yield improvement under traditionally low nutrient regimes, low moisture levels, strong competition from other plants and the depredations of diseases and destructive parasites. Thus, the decision to undertake research into high-yield crops based on production requisites — not yet a part of India's rural economy — was a major departure from an older research philosophy.

The rapid spread of the new practices among farmers should lay to rest the vision of the Indian agriculturist as a stubborn, changeless robot slavishly following his inherited agricultural traditions. I have a particular pique with the too often repeated cliché that "What can you expect? They have been doing it for a thousand years, and why should they change now?" I have yet to meet a thousand-year-old farmer, and I can think of many reasons why farmers of any age might wish to change if new methods are more efficient and profitable. And therein lies another key. The new varieties were profitable. Adopters found modern wheat farming most rewarding. The price increase for grain in the famine years was given extra leverage by a price decline in nitrogen fertilizer resulting from new techniques of manufacture. In the early part of the decade, it required about seven kilos of wheat to buy one kilo of nitrogen — considering risk, it was hardly an attractive proposition when the kilo of nitrogen would add only about ten kilos of grain to output. By 1968, however, it required roughly three kilos of wheat to buy a kilo of nitrogen — a most attractive proposition when the new varieties yielded up to 20 kilos

of extra grain for the three spent on nutrient. It was the engine of profit opportunity that drove the innovative dynamic of the countryside.

The modernization of Indian farming in 1968 was evident in only a few parts of the country. Technical limitations held farming static in most of the unaffected areas. Lack of assured irrigation was the most critical constraint in North and Central India, and unsuitability to wheat production left other areas isolated from the opportunity to adopt. For many reasons, the dwarf rice varieties available had little adaptability to Indian conditions – a phenomenon that is slowly yielding to intensified research on rice – and the rice story is still some years from paralleling the experience in wheat. Advances in sorghum and millet are probably further behind. It is the lesson from wheat that set the perspective for what is to come.

The expansion in wheat output began mainly in the Punjab, Haryana and Western Uttar Pradesh. These areas were endowed with good access to irrigation; were equipped with good transportation systems; and, by the standards of rural India, had an excellent network of private and public agencies to serve the farm community with the factor outlets and product markets necessary to initiate and sustain support for the transition to a modern agriculture. In part, the legacy of twenty years of rural development activities set the foundations for what was to come. It was the organization and ready response to changing needs by the farm services enterprises and public agencies, including the district officers and development personnel, that permitted cultivators in these regions to adopt successfully the new technologies of production.

Wheat growing is particularly suited to individual decision-making. And so it was with the spread and adoption of new varieties and changed practices. One farmer, almost with reference to his neighbour, could plant dwarf strains, add fertilizer, and, as long as he could control the irrigation of his land according to his need, he could harvest the fruits of his enterprise. But the individual decision was heavily dependent on an assured flow of production supplies: seed, fertilizer, water, even hired labour. Thus, the capacity and responsiveness of the network providing farm services is as crucial to facilitating innovations as the excellence of the technical package and a high economic incentive. The true measure of the growth in wheat output is to be found in the articulation effected under Government supervision that brought together the research scientist, the extension

workers, the industries, and dealers supplying farm requisites (including help from foreign assistance agencies), the marketing agents, the credit sources, and others, while holding economic incentives to the favour of the farming entrepreneur.

The three-year period – 1965 to 1968 – began with the despair famine and ended with the solid evidence that the somnabulant national agriculture could be aroused and vitalized, and made a major contributor to the national destiny. Hope rode high in 1968. And too soon, the lessons of twenty years were forgotten.

III. 1969 to 1974: Triumph and Stagnation

Wheat production continued to rise from 1968 to the present, faltering only in the drought of 1972-73 when electricity, diesel fuel, and fertilizer shortages left gaps in the available supplies of water and nutrient. Between 1968 and 1972, wheat output grew at the rate of 12.6 percent per year as both yield and area increased in about equal proportions. It is a popular myth that wheat displaced gram, a matter of significance because of the importance of gram as a protein source. Actually, wheat mainly displaced barley in farmland allocations – a more sensible substitution since both compete closely for irrigation water.

But, overall, the wheat story remained the only tale really worth telling. Rice output continued to rise but at a rate of only 3.2 percent per year – not appreciably higher than the rate attained in the Third Plan period of the early sixties. Total foodgrain production between 1967-68 and 1971-72 rose by over three percent per year, but when wheat is excluded, the rate drops below one percent per annum. Indeed, if wheat and rice are both excluded, total output of the remaining foodgrains falls by almost 1.4 percent per year; in part, a phenomenon explained by an increased allocation of the better endowed acreage to wheat, but in part also a reflection of the uniqueness of the wheat experience.

Yet, it was from the growth in wheat output that the nation was able to build a substantial buffer stock and reverse the upward trend of grain prices begun in the early sixties. Prices fell in 1969 by 12 percent and remained below the levels set in the famine years of the sixties until the drought of 1972-73 started the upward march again – this time in lockstep with a worldwide inflation first in grain prices, then in oil and industrial products.

The period 1967-68 to 1974-75 looks depressingly similar to the period of 1953-54 to 1963-64. As in the earlier period, production grew at an overall rate not significantly different from zero. And, again, the period embraced a drought year that cast severe doubt on the soundness of the agricultural policies being pursued by the Government.

The so-called "Green Revolution" had always been a target of scholarly opposition. The production increases were seen as giving rise to new sets of problems promptly dubbed "second" and "third" generation difficulties. The social consequences of agricultural modernization were embraced in the "second" generation set, and the consequences of farm surpluses in the "third" set. For some of us who watched closely, the issues still demanding attention were the "first" generation difficulties of how to sustain and extend the modernization process. By 1973, it was clear that the farm dynamic begun in 1968 was no longer the driving force it had once been. A revolution in rice production similar to that in wheat did not (and has not) materialized; sorghum and millet have been affected hardly at all.

During the years of dynamic output change between 1968 and 1972, it became popular in some quarters, in both India and abroad, to argue that the problem of assuring the nation's food supply was solved, and attention should again turn to industrial growth. Some who espoused this view joined others in playing the familiar themes of rural reform, now with added variations of concern that the technologically based change in the farming economy would make reform more difficult because it added to land values and gave further power to the entrenched social elite of the countryside. Indeed, who really benefited from the higher-output agriculture became an international *cause célébre* among social scholars and self-appointed protectionists of various social and economic interests. Added to the battle of words and writings at this time were the ecologists who worried about everything — from fertilizer and pesticide use to the large areas of land being sown to the new grains because of potentially hazardous disease conditions (a factor already being closely watched by Indian scientists).

Many, if not all, of these arguments had important elements of truth. At first, it was the larger farmer who could afford the risk of experimentation and thereby reaped the early innovator's rent, but evidence soon indicated that the smaller farmer was not far behind in

the adoption cycle once the costs of learning had been paid and risks reduced. It is true that there are ecological and environmental consequences of non-traditional technologies, and we need to know more about these. The pause in planning in the mid-sixties did slow Indian industrial investment and it needed to recover if only because the new agricultural technologies required a large industrial base for their support – a base not envisaged in earlier plans.

In recalling this phase, it is well to remember that in 1968 Indian agricultural growth rested on the three legs of a new crop production technology, economic incentives for its adoption, and an infrastructure to deliver the necessary off-farm services to innovating cultivators. Farmers responded to these three elements insofar as it was possible to do so by personal, individual decisions. The first limitation to this decision-making was the supply of water for irrigation. Cultivators who could, responded by sinking their own small wells and pressuring State authorities for an electricity supply to power their pumps. Where electricity was not available and groundwater was, diesel pumps were installed. Between 1968 and 1974, the estimated number of electric and diesel pumps in use more than doubled – from under two million to well over four million. Private investment in groundwater irrigation far outstripped public expenditures in the same period. Irrigation investments by individual farmers, however, could effectively be made only in those areas with relatively high groundwater tables and free-flowing, rapid recharge aquifers – a boon to the Ganges plain and particularly to the light soil regions of Northwestern India already endowed with canals and public tube wells. Even those lucky enough to be able to exploit irrigation opportunities could not, by themselves, insure the electric supply, or the timely availability of diesel oil, or of fertilizers, or of credit, or of superior seed. In time, and as more cultivators became participants in the newly emerging farm economy, the pressure on the supply of off-farm production factors began to approach the capacity of the nation's industries, public utilities, and Government services to deliver the needed support.

The difficulties were most apparent in fertilizers. The Indian fertilizer industry has long been a football among political ideologues. To build or not to build the industry; and if to build: who should do it and under what terms? The debates are important to striking a national political posture, but they are time-consuming and they have resulted in a diminution of service support for the

growth of food output. In the early seventies, a State Chief Minister pointed out to me that, at the farm level, fertilizer was "no longer a mere factor of production – it is now a political commodity!" And it was an economic one, too. An uncontrolled fertilizer market had grown beside the official one. In early 1974, official prices for nitrogen were between Rs. 2.20 and Rs. 3.25 per kilo, depending on its form; the uncontrolled market ran 40 to 50 percent higher at between Rs. 3.20 and Rs. 5.40 per kilo.

There are many ramifications in the fertilizer story that need not concern us here. It is sufficient to say, that from 1968 to the present, Government policy, or rather the lack of it, has left the nation's farmers, and thereby its consumers, vulnerable to nutrient supply vagaries that have hobbled the course of agricultural development.

These vagaries have had two effects. The most obvious one was to disrupt farm production plans by unavailabilities, or to lower yields because of shortfalls in applied amounts. The second effect was the less evident impact on profitability. It is too early for a definitive study of the effect of fertilizer use from changes in the relative prices of grain and nutrient. Using data from 1953-54 to 1972-73, my colleague, Dr. M.S. Rao, has calculated that a one percent change in relative prices will result in a one percent drop in fertilizer use. Since 1968, the movement in the ratio of official fertilizer-grain prices has been somewhat erratic, and its swings have been probably accentuated in the unofficial markets. The result cannot be other than a slowdown in the adoption of new varieties and a cutback in yield due to lower fertilizer use. Particularly worrisome was the 20 percent change in the price ratios between 1974 and 1975 when the price of fertilizer was allowed to rise at a faster rate than the returns from grain production. This will slow a rising demand for nutrient, but it will have a longer-term adverse effect on the modernization of farming and on the subsequent availability of food supplies.

A somewhat different story holds for the other critical input to modern farming: water for irrigation. No doubt the steady progress of rural electrification will generate a continued expansion in private investment in farm pump sets. But the areas where groundwater exploitation is easy are nearing a limit and further expansion in irrigation will necessitate even larger public investments. Until recently, Indian irrigation development focussed on large dam reservoirs and canal distribution systems – most designed on the British model to deliver small amounts of water to large areas as a drought

protection measure. Modern farming technologies demand a new principle of water allocation. Well fertilized new varieties require three to five times the amount of water needed to insure the minimal yield of traditional seed strains. This fact explains why so many farmers served by canal systems found it profitable – even necessary – to install their own pump facilities. In the years hence the nation must allocate large investments for irrigation systems capable of serving a high-productivity agriculture. It will mean the re-designing of old systems, the combining of surface water with sub-surface pumping and the construction of new field channels and drains to give each farmer a significant measure of control over the flow of water to his particular plots. To make it all effective, fields will have to be consolidated, shaped and levelled to proper slopes, and adequately protected from erosion, salinity and water-logging.

One of the more disturbing aspects of the past few years is a relative stagnation in research. The wheat breakthrough in the late sixties was presaged on the research plots in the early sixties. In 1975 there were no comparable harbingers of the shape of national agriculture five years ahead. Punjab farmers are now complaining of a stagnation in yields. In this India is not alone. The revolution in farming methods that began in 1968 served merely to bring India and other countries bordering the tropics onto a yield par with temperate-country agricultures. Today, on research stations throughout the world, wheat has hit a yield plateau. But for India, the future research breakthrough must be in rice and while notable advances have been made in improving this crop through the ICAR's All-India Coordinated Rice Improvement Programme, efforts still fall short of what is needed to bring national rice production into line with that of wheat. I know something of the many pressures on the ICAR executive officers as they strive to develop a national agricultural research agenda, but, as I put the nation's food production into an historical perspective, I cannot help but wonder if the research agenda and resource allocations have given adequate weight to the necessity of expanding rice output over the next decade. The modernization of the nation's infrastructural support of farming, such as irrigation and road networks, will take time to implement and yield results. Only a significant transformation of the nation's rice economy can fill the gap between the "then" and "now".

In looking back, I think there is clear evidence that, if the ingredients of the "Green Revolution's" technology, incentives, and support services are sustained and advanced, the nation's farmers will respond and output will grow. It was unthinkable ten years ago for West Bengal to be a wheat producer; now it grows a million or more hectares; Eastern Uttar Pradesh was a "backward" area in fifty years of official documents, today it is a thriving farm region clamouring for electricity, roads, fertilizer, and processing plants and markets. The story, in one form or another, is repeated across most of North India and into many parts of the Deccan. But it has not touched all of India's rural areas, nor has the course of change been sustained in many of the regions where it was pioneered. Indeed, a confusion of policies and a reluctance to push with vigour large private and public investment into the appurtenances of support for a modern agriculture slowly turned the triumph of the late sixties into a stagnation of the early seventies. Even this year's promise of 114 to 115 million tonnes of output is five million tonnes short of what should have been — if the nation had enjoyed a three percent growth rate from 1967-68 to the present — a little below the rate of demand growth at constant prices. In the overall, the total gap between these trends over the past eight years is more than 45 million tonnes.

In this perspective, the "Green Revolution" seems to be a one-time event that shifted the nation's productive curve upward by about 20 million tonnes. And, in fact, this will be the case if the ingredients of its beginning are neglected in the future. It will be otherwise if the lessons are learned and applied. The oft expressed political will that India use its bountiful resources of water, sunlight, soil, and climate to feed itself must be accompanied by the political action necessary to build the programmes of sustained support for the country's farmers. They have already demonstrated their eagerness to become full partners in national economic uplift, they hold and work a land resource that has the greatest potential in the world to produce food, and if made partners in national development, they can give the nation a food abundance greater than any of us has dreamed.

IV. 1975 Onward: Self-Sufficiency and Exports

In 1972, a worldwide drought reduced known stocks of food from a world supply of roughly 90 days to less than 35 days. The

harvests in the years following have been able only to add a few days to world reserve stocks, and the 1975 poor crop in the Soviet Union will likely drive available stocks to below 30 days. This is one index of world food security, or, better, insecurity. It was the Russian purchases of 1972 that triggered a worldwide food inflation and set the rationale for the oil price increases of 1973. Indeed, the instability of Soviet agriculture must now be viewed as a major factor in any consideration of India's prospects of feeding its peoples. North American, and primarily U.S., farms now account for the supply to over 90 percent of the world's grain trade. And the bins that held almost three months of world requirements in 1965 can no longer be relied upon to meet a short-term crisis of the size experienced in India in the mid-sixties. In fact, it is doubtful if they can ever be relied upon again. Food demand in the Soviet Union is increasing as its citizens seek diets richer in animal products. Observers of the organizational difficulties and climatic vulnerability of the Soviet farm economy are frankly sceptical of the continuing ability of Russian farmers to provide an assured domestic supply of food. The large variation in recent world grain transactions induced by the ups and downs of the Russian harvest may be stabilized somewhat by the long-term purchase agreements the U.S.S.R. will likely sign with the U.S. and Canada; but with the best will in the world to support the emergency food needs of countries like India, the prospects for long-term commercial sales of food from North America may, and likely will, cause future emergency aid to be drawn from the leftovers.

If there is a world food problem today in the sense of a world concern for hungry people, India is the centre of that problem. The few millions living in Africa's Sahel are difficult to succour in times of drought not because they bite deeply into stocks, but because moving food to them is hampered by grossly inadequate transport facilities. Even the masses of your Asian neighbours could be greatly helped through a period of crop failure by relatively small supplies when compared to this country's needs for a population of over 600 million. Contrast the approximately nine million tonnes of grain shifted to India in the years 1966 and 1967 – about five percent (each year) of the then annual world reserves – with what would be needed today for a similar proportionate support of domestic consumption. This was enough grain to feed 65 million people at average consumption levels – about 13 percent of the total population. Today, a similar percentage of the population, or 79 million people,

would require over 12 million tonnes of grain – about 11 percent of the world grain reserves held during the past two years. When people talk of the fear of famine in the world, it is India that looms largest. And for no reason when viewed against the nation's production potential. I am fearful that two successive years of drought like those of the mid-sixties or of 1972-73 will find neither this nation nor the world community at large able to stay the awesome hand of famine.

If this is permitted to come to pass the cause will be the neglect of this nation to exploit for itself its vast human and geographic potential to produce food. The sunlight energy for the production of plant materials, the rainfall for recharging both surface and underground reservoirs, the huge areas of soils responsive to management, the large and thriving scientific establishment, and above all, the vast number of skilled, capable and innovative farmers are the assets needed to make this nation a major net contributor to the world food supplies. That almost 30 years after political independence India has not become food independent borders on being a national shame. Unless food independence is pressed with the same vigour as the fight for political independence, India will never attain the full sovereignty that its endowments can and should ensure.

The gap to self-sufficiency is not large. Net grain imports over the past decades have averaged less than five percent of domestic production. In terms of the increased productivity of a fertilized and irrigated hectare over one that is farmed by traditional methods, the present gap is equal to the output from 1.5 million hectares, an area less than one percent of the nation's total cropped land. A carefully implemented extension of modern methods of farming to an additional few million hectares each year would assure not only closing the import gap, but of remaining abreast of the demand for food as it rises in response to the inexorable pressures of population increase and the desire for better diets that results from the growth of national personal income. Simple projections of various trend assumptions between now and 1985 would suggest that unless population growth is lowered dramatically or national income growth is virtually stagnant, the gap between the domestic production and domestic demand will, at best, remain at about five percent, the size of the gap growing absolutely from about five million tonnes to over seven million tonnes. In fact, the real prospects for India as it looks ahead is either to accelerate the development of its national food production potential, or to enter the world's commercial grain market and seek to

assure a long-term supply through appropriate forward contracts. To me the latter proposition is ludicrous when placed against the immense untapped farm potential of the nation.

The cocktail circuit talk in some national and international circles has taken to reviewing world economic development as being analogous to a lifeboat. Briefly, the analogy focuses on sea disaster where a single lifeboat is launched but with a space too limited to welcome all who seek to come aboard, thus choices must be made about who to save and who to abandon. In the talk, world resources, and particularly food supplies are equated with the space available on the lifeboat; who is worthy of saving is the point of the conversation. India, along with some of its neighbours in South Asia is seldom considered a candidate for salvation.

I do not want to dwell too long on a game played by the well-fed. It is a contemptuous exercise devoid of humanity and humility that engages only the arrogant who are ignorant. But there is a point to be marked from it, however distasteful both the exercise and the point may be. The point arises from the generally accepted criteria that those worthy of salvation are those who have exhibited a greater vigour of self-help and made the larger effort to realize their own potential. These are the ones for whom the lifeboat is seen as a bridge to a self-sufficient future. By this measure, India's continued food difficulties despite its agricultural potential, place it among the candidates for abandonment. No more than a pique to pride to be sure. But it is a reflection of how others view this nation's post-Independence agricultural history. A reflection that may find wider currency becoming an element in the policies of other countries should the years ahead find food supplies inadequate for global needs.

All the signs now apparent in world agriculture point to a foreseeable future that is unlikely to enjoy luxurious food indulgences of the past quarter century. The product of the enterprise of North American farmers will probably not be found in the stored abundance of five years ago. This nation must recognize that its only true secure food supplies are those found within its borders; that its credibility as a national power rests ultimately upon its capacity to feed its population; and that if its agricultural policies are drawn to match and realize its productive potential, it can and will emerge as one of the world's great suppliers of man's daily bread.

V. A Prospect

If stated intent could give sustenance, India's last 20 years could feed the world. The massive output of the nation's official presses, the rhetoric of the politicians, and the hours its planners and bureaucrats have spent talking and writing about the need to develop the nation's agriculture leave no doubt about the will to transform its agricultural base. Yet the result has not equalled the intent. In this overview I have touched in a sketchy fashion on the many forms of action the intent has taken and on why I believe some failed and some were successful. Only in the past eight years has a segment of the country's agriculture shown a dynamic equal to that pictured in the writings and speeches about national development. Today there is early evidence that the sources of this recent dynamic are in danger of being disregarded, and the drive toward transformation may be sapped instead of sustained, confined instead of spread. If this is so, the nation will remain enthralled by the vagaries of rain bearing winds and the movement of international grain markets and prices. The same factors that irretrievably reduced the foreign exchange balances required to attain the expected accomplishments in each plan period since 1955.

I want to close my lecture by touching on a few of the points I believe emerge as lessons from a perspective of the nation's post-Independence agricultural experience.

I believe the greatest present danger to India's farm progress is the wavering and uncertain focus of its national agricultural policies. No one disputes the evidence of the strong political will to foster agricultural growth. But political will without organized, sustained and purposeful political action avails of little. The record reveals that, except for a few years at the end of the sixties, political action of this kind has been less than adequate.

A significant feature of India's agricultural development policies has been a confusion of program purposes with many labelled as undertakings to foster development being designed in reality to promote the welfare of agriculturists and the rural people rather than the growth of agricultural output. The two goals are not synonymous; each in its own right is a national purpose worthy of separate pursuit. It becomes counterproductive if the aims are fused and pursued as if they were or could be a single goal. Assistance to low income farmers, to drought areas, to landless families, to improving the well-being of small cultivators, etc., are programs that need no justification beyond

the goal of helping poor people. To place these activities under the heading of agricultural development and to divert resources to them from the allocations earmarked for efforts to foster agricultural growth is to misunderstand the separate nature of each purpose. Welfare programs contribute little to the longterm capacity of the nation to produce food and fibre. Their goal is to distribute more equitably the nation's economic product and social and economic opportunity. Their accomplishments are properly measured in these and not productive terms. Why not call them what they are and be proud of what they do? In fact in the final analysis a case can be made for placing their execution under a separate Ministry so that confusion is avoided and the officers concerned with each activity know precisely the purposes they are to accomplish.

The development of Indian agricultural productivity is the gargantuan task of mobilizing and extracting from the nation's geographic and human resources the product needed to secure the welfare of the nation as a whole. It must be pursued with the purpose of building within the country a capacity to produce food and fibre that will meet national requirements regardless of what the rain-bearing winds may bring. The policies to bring this about must recognize that the national interest is paramount. Regional and sectional interests must not be permitted to hobble the efforts to insure food for all. Their valid concerns should be met through other programs. To transform a traditional, agrarian social and technological structure into a modern farm society with all the apparatus of factor and product markets, public services and industrial support requires huge capital expenditures that must be met with a cold eye to maximizing the comparative returns to the nation. The history of India's agricultural development investment indicates that such a cold eye has too infrequently attended the accounting of the expenditures made.

The experience of the late sixties sets the policy guides for the future. It begins with research and a focussing of research endeavours on the priority needs of national food production. Research scientists must guard against trying to do too much or to embrace all problems at once. The focus of national research must not be so diffused as to make impossible the hard effort required for discovery. It is always possible to defend additions to a research agenda. Resisting the temptation to add new programs is the hardest task of a research management that strives to find and hold priorities. Research topics should not be dictated by immediate fashions of thought, they must

be derived from a continuous careful assessment of the nation's persisting needs.

India is unique among developing nations for the number and excellence of its agricultural scientists. But the quality of its human resources is far from matched by the size and quality of the physical research facilities available to employ to best advantage this pool of talent. An early investment in laboratories, equipment, field plots and libraries is required if the Indian scientific establishment is to be fully used to provide the advances in knowledge that must underpin future agricultural development.

Sound research results are a first requirement for modernizing agriculture. But farmers will not adopt more productive and technically superior methods unless they are also economically profitable.

Much has been written about the economics of India's farming. Most of it reduces to the simple fact that, whether for small or large farms, the prices of added farm inputs relative to the added returns from their use (all adjusted for risk) determines in India as in other market economies, the margins of profit from modern farm methods. These, in turn, determine whether new farm production technologies are adopted or rejected. At the time of declining farm prices it is well to keep this single element in mind. Its neglect will not only stifle innovation but may well reverse advances already underway. I shall return to this theme later.

Once the technology is proven and profitable to apply, the farmer can only act if he is at the end of a functioning supply line of production requisites. Non-traditional, high-yield agriculture demands non-traditional farm inputs. High plant population per unit of area requires heavy dosages of nutrient and water; high plant populations need insect and disease protection; rapidly maturing varieties open opportunities for multiple and sequential cropping of the same land – often demanding a close timing of farm operations capable of being met only by mechanical power units that are more efficient than animal power.

It seems characteristic of agricultural development, however, for scholars and others involved in policies to resist or to agree lengthily about just how much is needed from non-farm sectors to foster modern farming. Somehow the list of requirements to support the operation of a modern steel industry is accepted with only complaints about its costliness. This is not so for the food production industry. There is a powerful and deep-seated belief that a modern agricultural

industry should be able to get along with less, much less from extra-rural economic activity. It cannot. Modern farm technology is a whole cloth. It is greater by far than the sum of its parts. If rent into selected pieces, its productivity drops drastically. High yields need high application of plant food. Nutrients in the amounts required call for modern fertilizers – green manures will not suffice – which in turn calls for all the assorted elements of industrial support. Just as high-yield farm technology is indivisible, the infrastructure needed for its support is a comprehensive whole. In India today, the modernity of a village as measured by its agricultural output is directly related to whether it is served with electric power and its proximity to a serviceable road. If the food problem is to be solved, it is investment in the infrastructure of support for modern farming that must command a lion's share of the nation's resources for rural development. There is no cheap road to food abundance. But a caution is due. Electric lines, roads, credit facilities, extension officers, fertilizer markets, storage depots will not make an iota of difference unless there are profitable, high-yield technologies to be extended to the farmers. This is the major lesson from the Community Development movement and the IADP. Infrastructural investment will be productive only in those areas where the unavailability of suitable farm services has blocked the spread of innovative farm practices. In some of the areas voluntary village improvement programs of the kind espoused by the Community Development movement might provide a ready method of building the rural civil works of such support.

I will not go into greater details of the infrastructural needs. The glaring areas of lagging investment in fertilizer capacity, in modern methods of water exploitation and management from reservoir to farmer's field, in road construction, in transport, in storage are part of the litany of India's development problems. But I do want to touch on one aspect that has received special attention recently, that is, credit for agricultural production. Indian rural credit institutions have had a long history of innovation and experiment. One element in this history has been a desire to find a single pattern of providing rural credit that will fit the needs of all. I think the experience to date demonstrates that no one pattern will suffice. India's diversity of geography and farm potential demands that farmers be able to select from a broad spectrum of amounts, terms, rates, and even risk insurances. The credit needs of small farmers are very different from those of large land-owners. And the greater risks of rice farming require

quite different credit arrangements from those offered to wheat growers. In credit as in so much in agricultural development, the attempt to treat everybody equally will end in treating all ineffectively. Until credit agencies undertake to provide a divergent range of services geared to the separate needs of each borrower, the nation's credit structure will remain inadequate to its mission.

One final comment on infrastructure. A sustained investment focussed on creating a comprehensive integrated pattern of modern services for the farmers of a region seems to have the happy consequence of permanently increasing the capacity of that region to produce food and fibre. In economic terms it shifts the supply curve to the right so that even with lower prices or profitability production will not decline to previous levels. A case in point is the recent experience of Northwestern India where, despite a lack of irrigation water and an early shortage of fertilizer, output remained high, holding the nation's 1975 rabi harvest to almost record levels. In a real sense, the investments made in modern wheat agriculture are true contributors to the nation's secure food supply. In the same sense, Indian planners would do well to set output targets not for years of average weather conditions, but for a level that would be attained as the minimum secured base in a year of adverse rainfall. In other words, planning for minimum needs in times of weather stress, not for projected needs if the weather plays fair and thereby, leaving the nation on the import lists or facing a food price inflation if the weather fails. Planning for a secure food output is possible; the key is a careful attention to the appropriate infrastructure investments, and to the circumstances for fostering innovation among cultivators.

The development of agriculture in this country still must traverse a long and difficult road. Neither the Indian farmer nor the many institutions engaged in his support can afford to journey far along the road if the map and rules of movement seem subject to frequent and unpredictable change. The immensity of the task demands that development efforts be purposeful and sustained over many years. There is not a discernible long-term strategy for India's agricultural development and even the administration of the shorter-term tactics outlined in each Plan has an ad hoc, chop and change air about it. It appears that, after each good harvest the temptation is to forget the urgency of rural development. The impetus for early decision is lost and complacency about food production stalks the halls of

Governments as officers congratulate each other. Expenditures lag and older plans are scrapped or delayed or set aside for another day. After each poor harvest or threat of it, the funds that could have sensibly eased the situation if spent in measured amounts earlier, suddenly appear as resources for "crash" programs or frenzied actions to be mounted on a war footing! The funds are spent but rarely do the expenditures add significantly to the nation's productive capacity. The urgent programs for drilling wells in Bihar in 1967 is the only case I can think of where a lasting impact was made on local irrigation capacity. This is not the way to transform a nation's agricultural base.

The recent reports of the National Commission on Agriculture attempt to give voice to both a long range development strategy and the shorter run tactics of its implementation. I hope the work of the Commission will establish a framework that effectively ends what can only be seen as a history of vacillation in development efforts. The recent integration of the Irrigation Ministry into that for Agriculture is another positive step for a constancy in agricultural development policies. Indian agricultural development planning and action must be built around programs that will span one or two decades, each program composed of building block projects that mesh in time and space to add to available production as each is completed. An early example of this type of program is the Command Area Development Schemes now being implemented in various parts of the country. But these can only be the beginning. In the long term these schemes must find their place as a sub-set of activity under larger, more comprehensive programs that will integrate all the elements of a modern agriculture into a plan stretching across a generation of development effort.

I have stressed that India's farm level dynamic was generated by the profit that could be captured by the farmers who adopted a technology encompassing dwarf varieties, fertilizers and intensive irrigation. Yet after each good harvest grain prices have been allowed to slip relative to farm costs. The most recent example of a profit squeeze on cultivators is the experience of 1975 when prices paid to farmers have fallen in some cases by more than 30 percent, a drop far from offset by the decline in fertilizer costs and made worse by higher charges for electricity, diesel fuel, manufactured farm implements, insecticides, in short all farm costs. One can agree that farmers should be taxed now because of the profits they have made in

the past few years. But it is a short-sighted argument. It is the economy and the consumer who eventually bear an ultimate cost in the form of higher prices and depleted foreign exchange (for food imports) because domestic food output has again stagnated as farmers lowered their production by reducing inputs. Other means should be found to tax agriculturists, reducing his profit from farming has not and will not be effective in the longer term. Indeed at the present time I find it surprising that farm prices are not being supported at levels that reflect recent increases in farm costs, levels that would be somewhat lower than market prices earlier in the year to ease consumer hardship, but certainly at levels above procurement prices that have not changed in the past two years. Such a policy would hold farming profitable and move the nation a giant step towards food security.

The unstable nature of farm profitability has, and will induce an instability in the nation's food output. In a country as vulnerable to monsoonal rains as India, the additional variation in food supply arising from economic factors is both unnecessary and dangerous. A policy aimed at sustaining the profitability of the nation's food agriculture would yield large dividends in the quest for a secure food supply.

The stop-go somewhat ad hoc nature of India's food policies in the last twenty years must not continue longer if the nation's integrity is not to be imperilled. Time is desperately short. The global food situation is too close to the lifeboat analogy for complacency, and the nation's population will continue to grow and demand food as their right as Indian citizens. The task ahead is staggering in its immensity for in the next 25 years India must modernize a major part of its farming if it is to double its food output for the 950 million people who will want their daily grain. While the past quarter century has seen the addition of roughly 60 million tonnes to national food output, these were relatively easy gains – more than half came in the first ten years. From now on the pull will be hard and heavy. The policies underlying it must be sure of purpose and enduring. Be it otherwise and the game is lost.

The nation has the physical and human resources not only to meet the challenge of the future, but also to contribute mightily to total world food output. Focussed and sustained policies for food output growth vigorously pursued over the next decade can and will make this country securely food self-sufficient, even place it firmly in

the ranks of the great world food producers. The task now is to build a vision of Indian agriculture as a modern economic sector of a modern nation. And to act to make this vision a reality. The beginnings have been made and given the political will for purposive and enduring action, I have no doubt there will be food abundance for all.